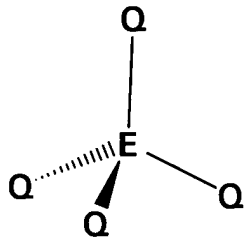
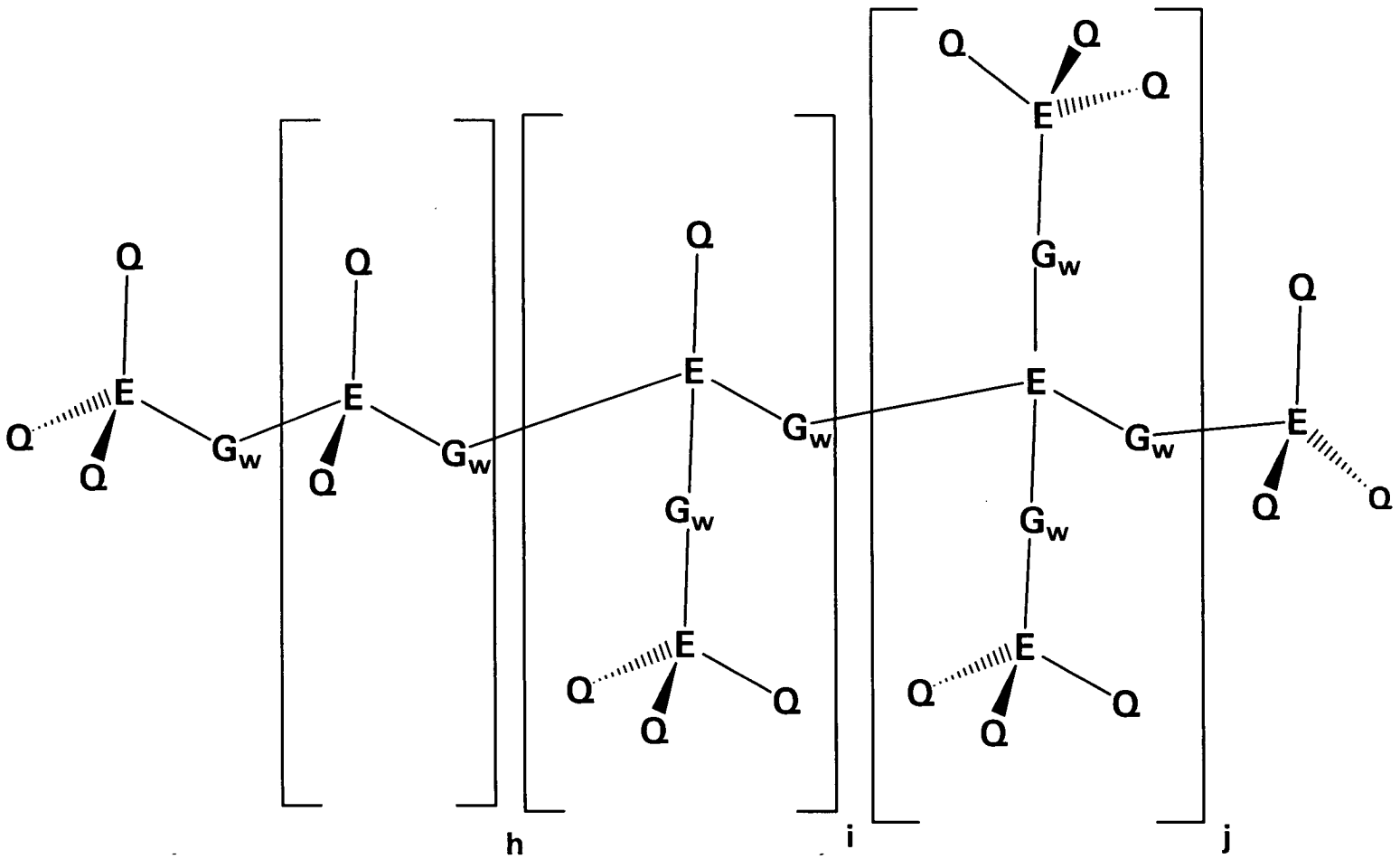
What is claimed is:

1. A composition comprising:

(a) thermosetting component comprising: (1) optionally monomer of Formula I



and (2) at least one oligomer or polymer of Formula II


Q
E
Gw
h
i
j

where said E is a cage compound; each of said Q is the same or different and selected from aryl, branched aryl, and substituted aryl wherein said substituents include hydrogen, halogen, alkyl, aryl, substituted aryl, heteroaryl, aryl ether, alkenyl, alkynyl, alkoxyl, hydroxyalkyl, hydroxyaryl, hydroxyalkenyl, hydroxyalkynyl, hydroxyl, or carboxyl; said G is aryl or substituted aryl where substituents include halogen and alkyl; said h is from 0 to 10; said i is from 0 to 10; said j is from 0 to 10; and said w is 0 or 1;

(b) porogen that bonds to said thermosetting component (a).

2. The composition of claim 1 wherein said thermosetting component (a) is functionalized.

3. The composition of claim 2 wherein said functionality is selected from the group consisting of acetylene; 4-ethynylaniline; 3-hydroxyphenylacetylene; 4-fluorophenylacetylene; and 1-ethylcyclohexylamine.

4. The composition of claim 1 wherein said porogen comprises a material having a decomposition temperature less than the glass transition temperature of said thermosetting component (a) and greater than the curing temperature of said thermosetting component (a).

5. The composition of claim 4 wherein said porogen is selected from the group consisting of unsubstituted polynorbornene, substituted polynorbornene, polycaprolactone, unsubstituted polystyrene, substituted polystyrene, polyacenaphthylene homopolymer, and polyacenaphthylene copolymer.

6. The composition of claim 5 wherein said porogen is functionalized.

7. The composition of claim 6 wherein said functionality is selected from the group consisting of epoxy, hydroxy, carboxylic acid, amino, and ethynyl.

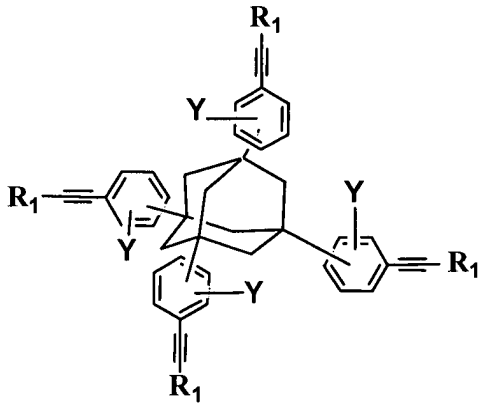
8. The composition of claim 1 wherein said porogen is covalently bonded to said thermosetting component (a).

9. The composition of claim 8 wherein said porogen is covalently bonded

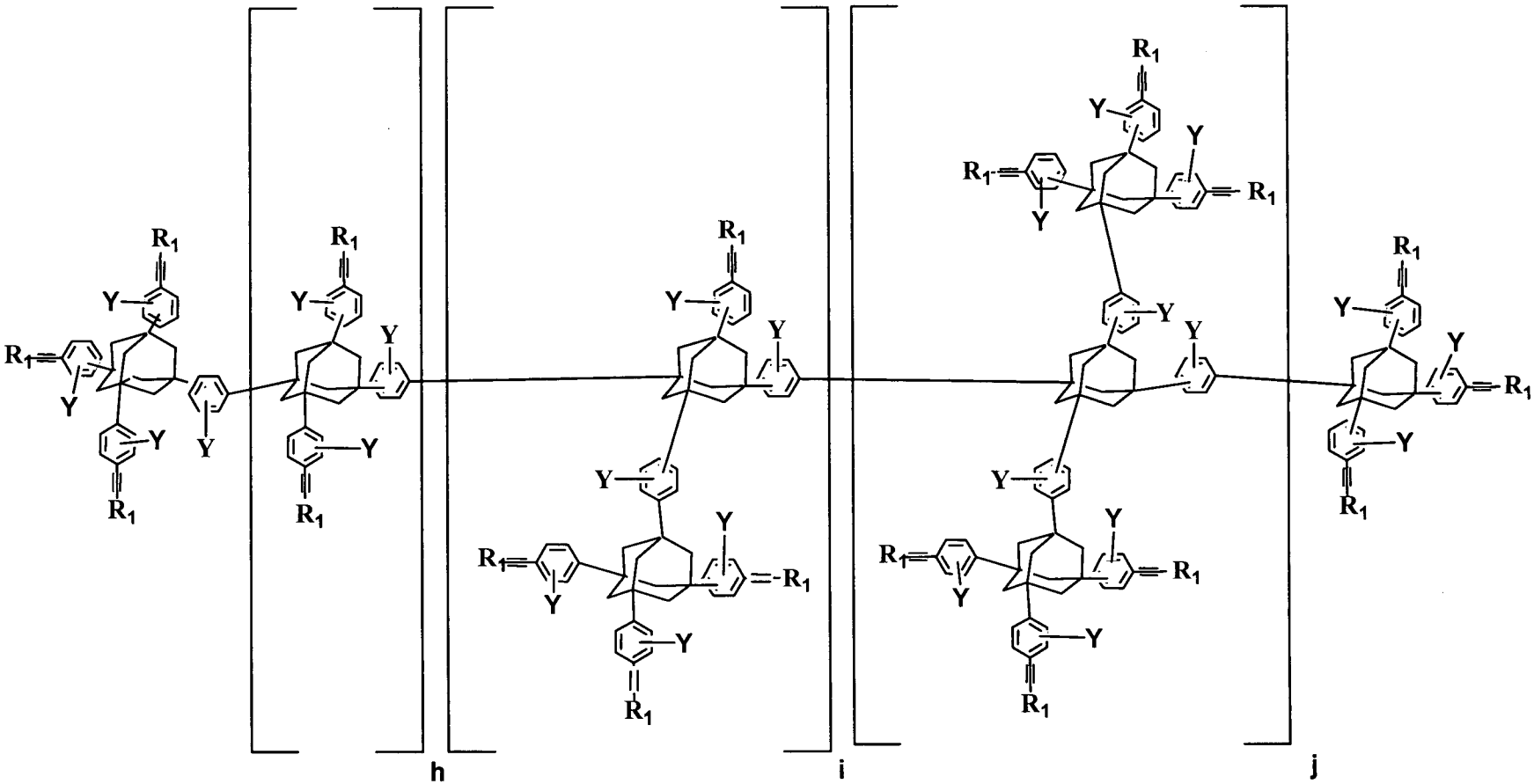
to said thermosetting component (a) through an ethynyl containing group.

10. The composition of claim 9 wherein said ethynyl containing group is acetylene.

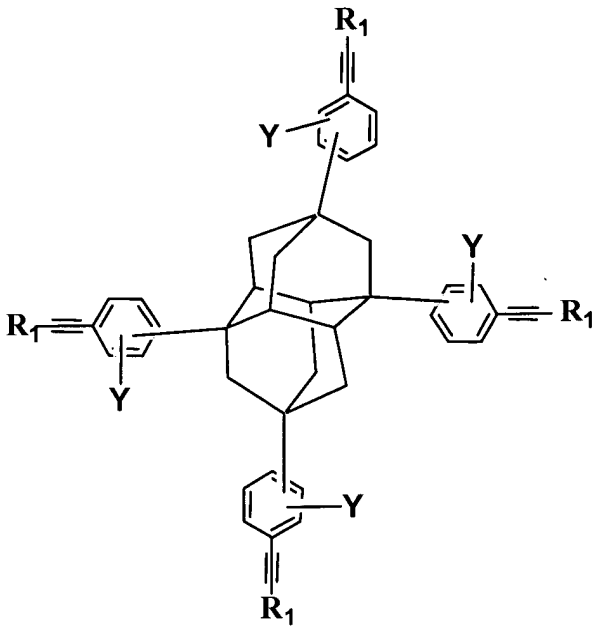
11. The composition of claim 8 wherein said thermosetting component (a) comprises (1) adamantane monomer of Formula III



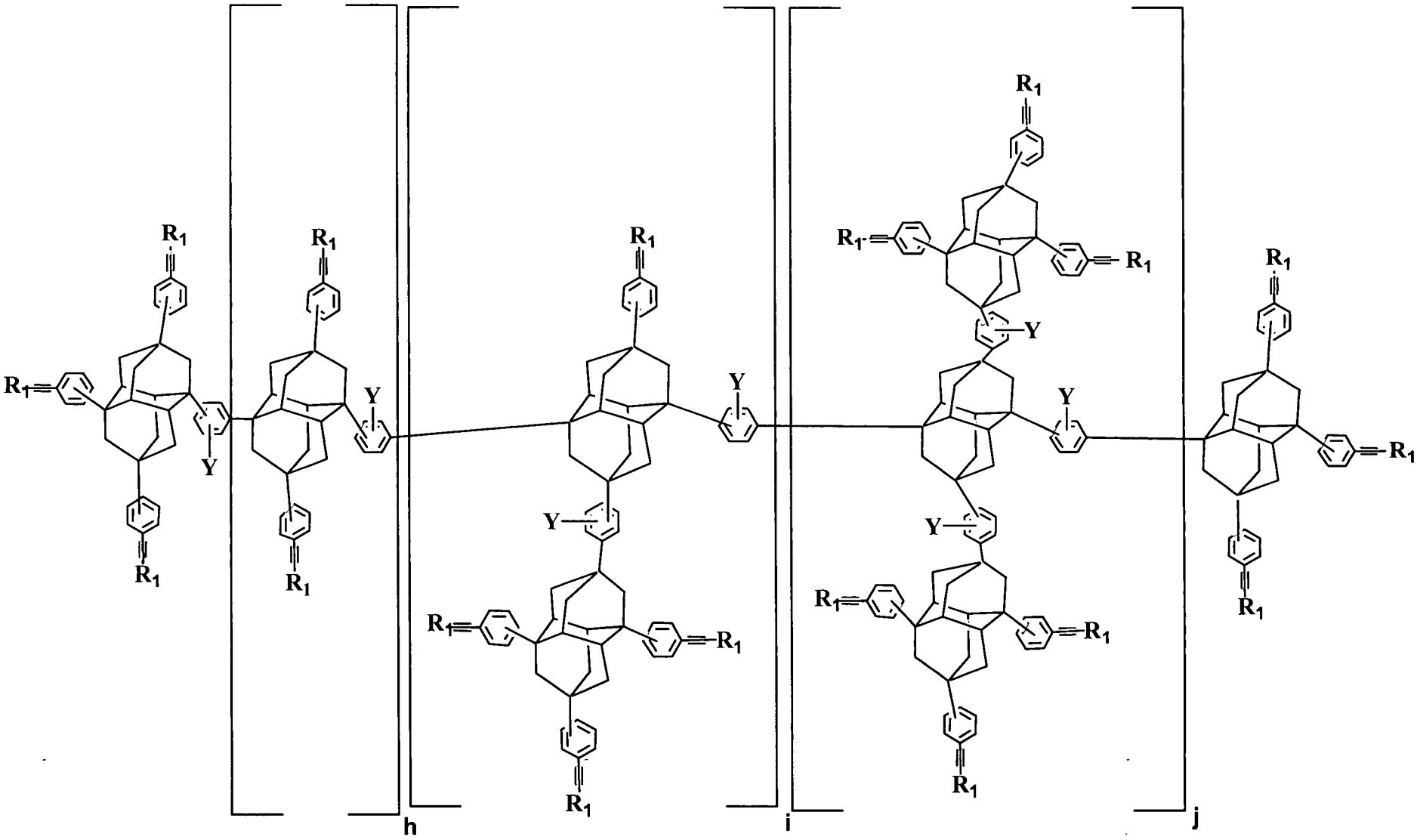
and (2) adamantane oligomer or polymer of Formula IV


R1
Y
h
i
j

or (1) diamantane monomer of Formula V



and (2) diamantane oligomer or polymer of Formula VI

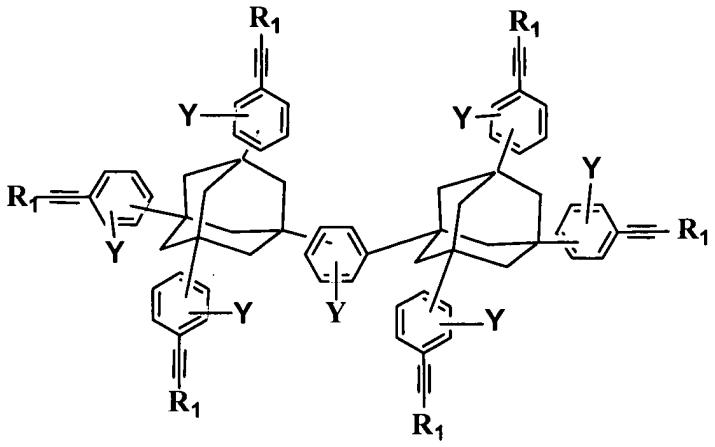

R1
Y
h
i
j

where said h is from 0 to 10; said i is from 0 to 10; said j is from 0 to 10; each of said R_1 is the same or different and selected from hydrogen, halogen, alkyl, aryl, substituted aryl, heteroaryl, aryl ether, alkenyl, alkynyl, alkoxyl, hydroxyalkyl, hydroxyaryl, hydroxyalkenyl, hydroxyalkynyl, hydroxyl, or carboxyl; and each of said Y is same or different and is selected from hydrogen, alkyl, aryl, substituted aryl, or halogen.

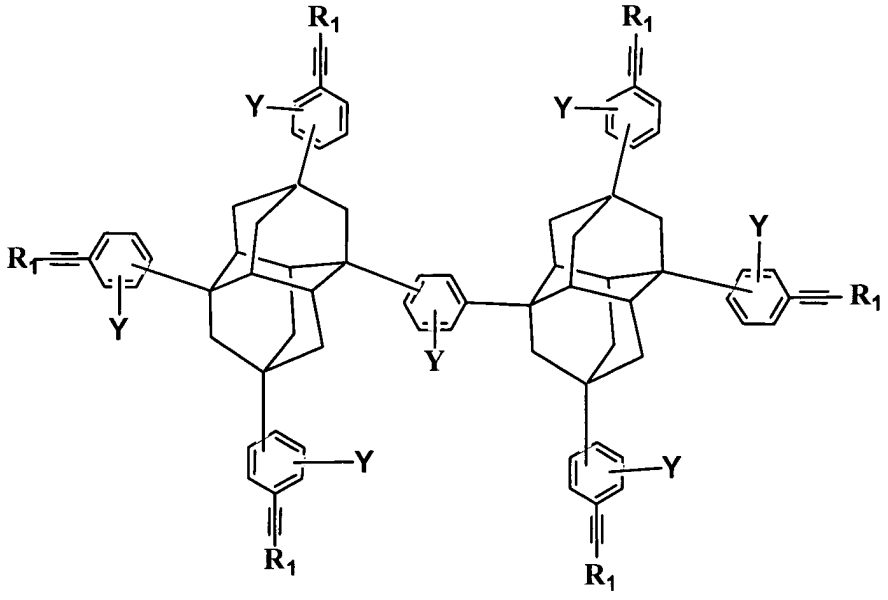
12. The composition of claim 11 wherein said monomer is present.

13. The composition of claim 11 or 12 wherein said R_1 is aryl or substituted aryl and said Y is hydrogen, phenyl, or biphenyl.

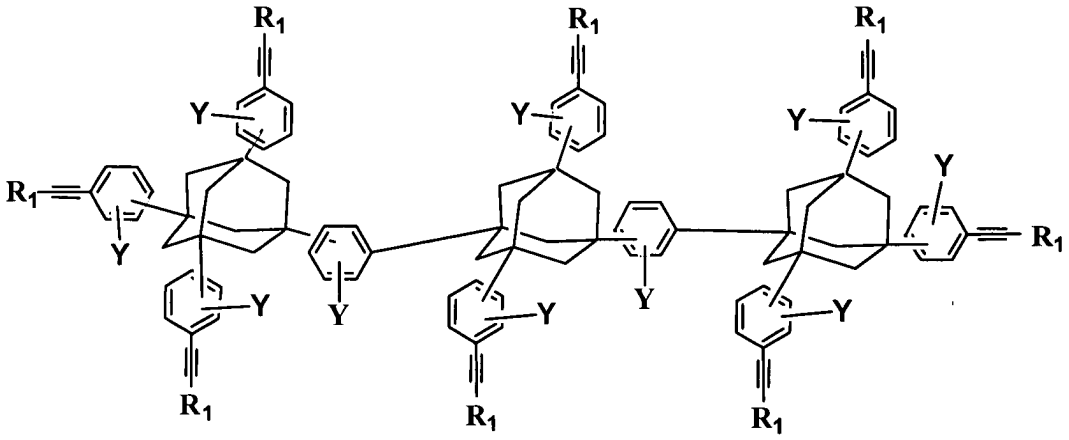
14. The composition of claim 13 wherein said (2) adamantane oligomer or polymer is dimer of Formula IX



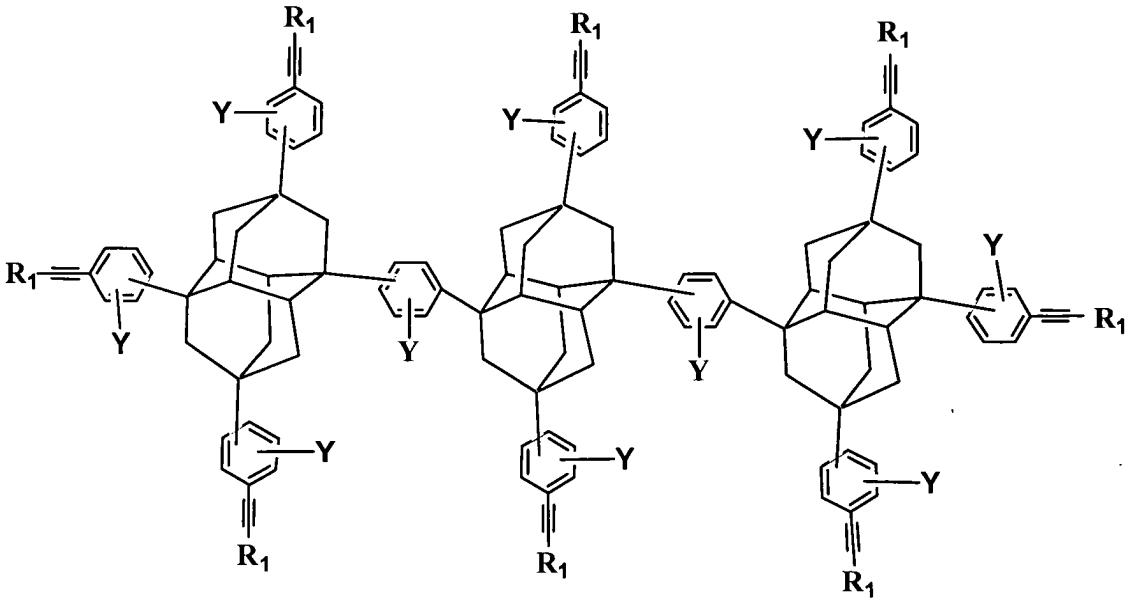
or said (2) diamantane oligomer or polymer is dimer of Formula X



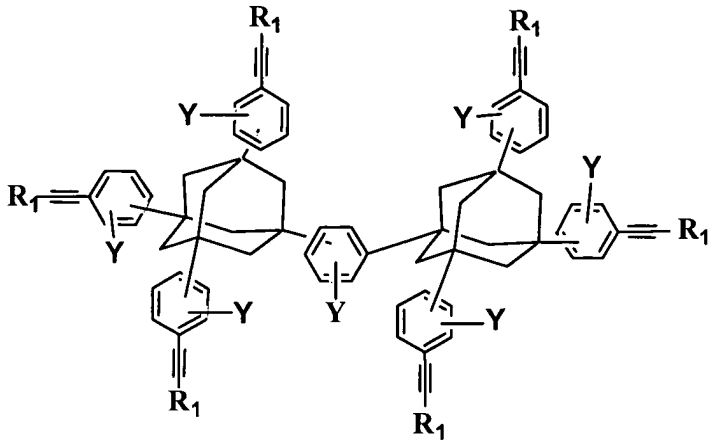
15. The composition of claim 13 wherein said (2) adamantane oligomer or polymer is trimer of Formula XI



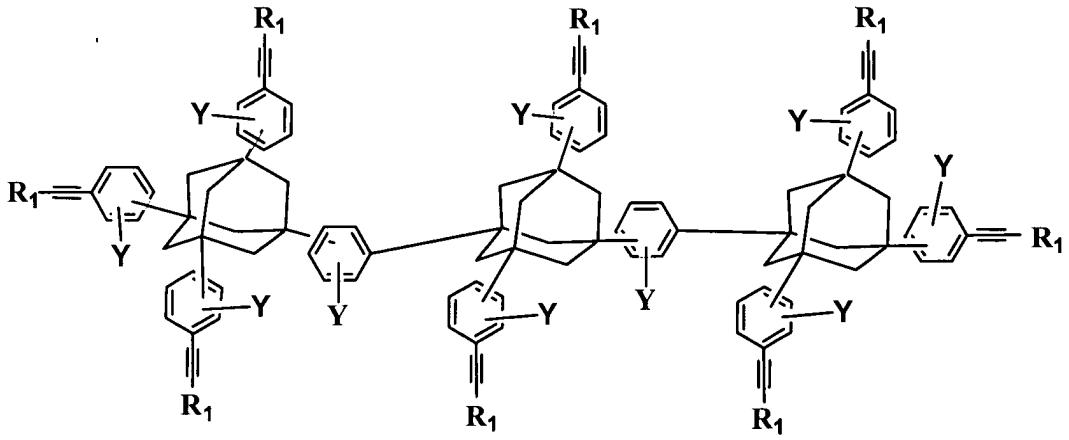
or said (2) diamantane oligomer or polymer is trimer of Formula XII



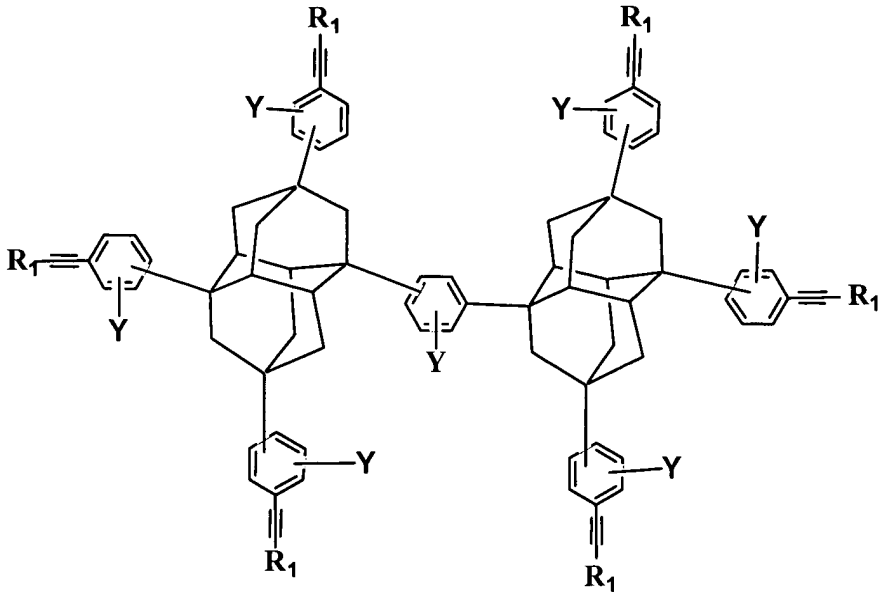
16. The composition of claim 13 where in said thermosetting component (a), said oligomer or polymer (2) comprises a mixture of adamantane dimer of Formula IX



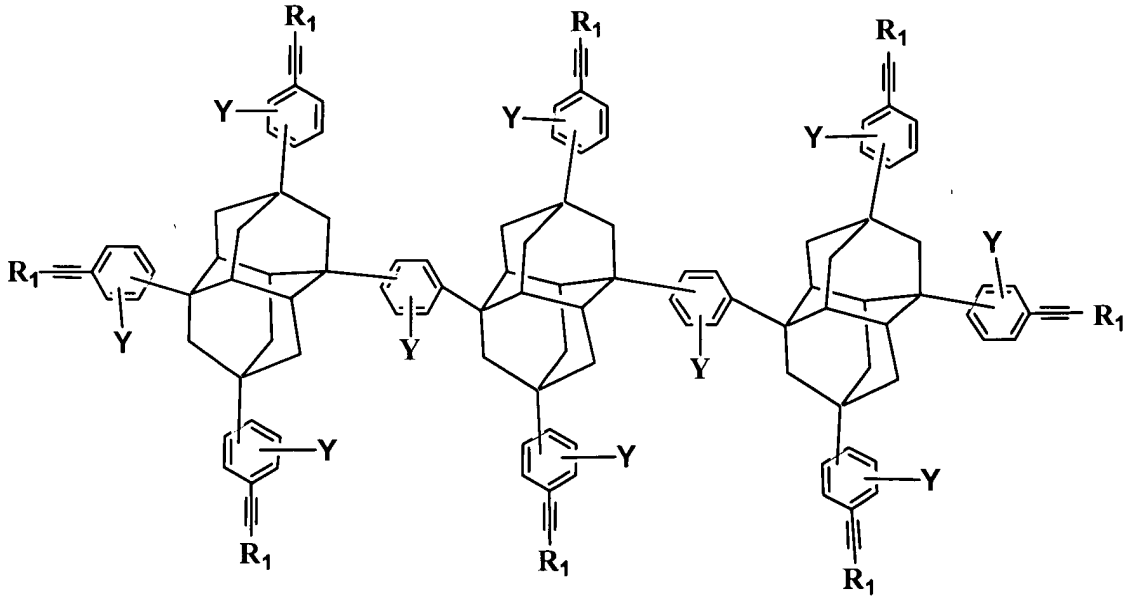
and adamantane trimer of Formula XI



or diamantane dimer of Formula X



and diamantane trimer of Formula XII



17. The composition of claim 16 where in said thermosetting component (a), said monomer (1) and said oligomer or polymer (2) are adamantane based monomers.

18. The composition of claim 17 wherein at least two of said $R_1C\equiv C$ groups on said phenyl groups are two different isomers and at least one of said phenyl groups between two bridgehead carbons of said adamantane monomers exists as two different isomers.

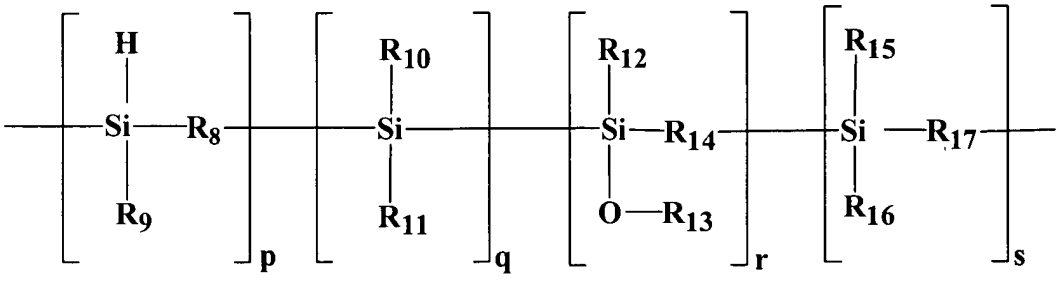
19. The composition of claim 18 wherein said at least two isomers are *meta-* and *para-* isomers.

20. The composition of claim 13 additionally comprising (c) adhesion promoter comprising compound having at least bifunctionality wherein the bifunctionality may be the same or different and at least one of said bifunctionality is capable of interacting with said thermosetting component (a).

21. The composition of claim 20 wherein said adhesion promoter is selected from the group consisting of:

silanes of the Formula XXIV: $(R_2)_k(R_3)_lSi(R_4)_m(R_5)_n$ wherein R_2, R_3, R_4, and R_5 each independently represents hydrogen, hydroxyl, unsaturated or saturated alkyl, substituted or unsubstituted alkyl where the substituent is amino or epoxy, unsaturated or saturated alkoxyl, unsaturated or saturated carboxylic acid radical, or aryl, at least two of said R_2, R_3, R_4, and R_5 represent hydrogen, hydroxyl, saturated or unsaturated alkoxyl, unsaturated alkyl, or unsaturated carboxylic acid radical, and $k+l+m+n\leq 4$;

polycarbosilane of the Formula XXV:



in which R_8, R_{14}, and R_{17} each independently represents substituted or

unsubstituted alkylene, cycloalkylene, vinylene, allylene, or arylene; R_9, R_{10}, R_{11}, R_{12}, R_{15}, and R_{16} each independently represents hydrogen atom, alkyl, alkylene, vinyl, cycloalkyl, allyl, aryl, or arylene and may be linear or branched, R_{13} represents organosilicon, silanyl, siloxyl, or organo group, and p, q, r, and s satisfy the conditions of $[4 \leq p + q + r + s \leq 100{,}000]$, and q and r and s may collectively or independently be zero;

glycidyl ethers, or esters of unsaturated carboxylic acids containing at least one carboxylic acid group;

vinyl cyclic oligomers or polymers where the cyclic group is vinyl, aromatic, or heteroaromatic; and

phenol-formaldehyde resins or oligomers of the Formula XXVI: $-[R_{18}C_6H_2(OH)(R_{19})]_t-$ where R_{18} is substituted or unsubstituted alkylene, cycloalkylene, vinyl, allyl, or aryl, R_{19} is alkyl, alkylene, vinylene, cycloalkylene, allylene, or aryl, and t = 3-100.

22. The composition of claim 21 wherein said adhesion promoter (c) is said phenol-formaldehyde resin or oligomer.

23. An oligomer comprising said composition of claim 20.

24. A spin-on precursor comprising said oligomer of claim 23 and solvent.

25. A thermosetting matrix made from said spin-on precursor of claim 24.

26. A layer comprising said thermosetting matrix of claim 25.

27. The layer of claim 26 wherein said thermosetting matrix is cured.

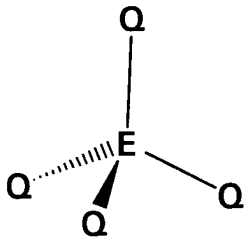
28. The layer of claim 26 wherein said layer has a dielectric constant of less than 2.7, preferably less than 2.5, preferably less than 2.2, and preferably less than 2.0.

29. The layer of claim 26 wherein said layer has an average pore size diameter of less than 20 nanometers.

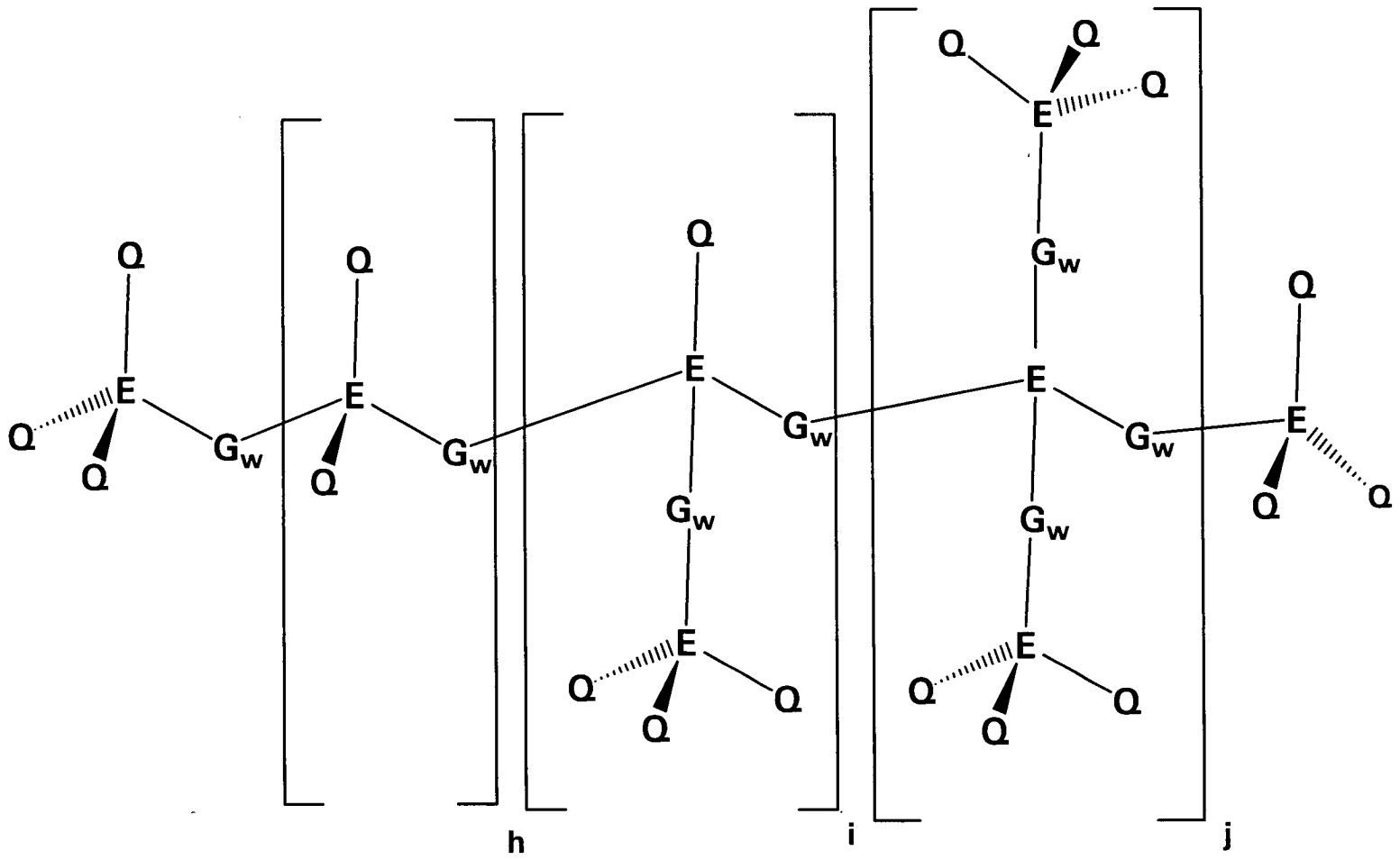
30. A substrate having thereon at least one of said layer of claim 26.

31. A microchip comprising said substrate of claim 30.

32. A method of lowering the dielectric constant of a composition comprising (a) thermosetting component comprising: (1) optionally monomer of Formula I



and (2) at least one oligomer or polymer of Formula II


Q
E
Q
Q
G_w
h
i
j

where said E is a cage compound; each of said Q is the same or different and selected from aryl, branched aryl, and substituted aryl wherein said substituents include hydrogen, halogen, alkyl, aryl, substituted aryl, heteroaryl, aryl ether, alkenyl, alkynyl, alkoxyl, hydroxyalkyl, hydroxyaryl, hydroxyalkenyl, hydroxyalkynyl, hydroxyl, or carboxyl; said G is aryl or substituted aryl where substituents include halogen and alkyl; said h is from 0 to 10; said i is from 0 to 10; said j is from 0 to 10; and said w is 0 or 1;

(b) adhesion promoter comprising compound having at least bifunctionality wherein the bifunctionality may be the same or different and the first functionality is capable of interacting with said thermosetting component (a) and the second functionality is capable of interacting with a substrate when said composition is applied to said substrate

comprising the steps of:

bonding porogen to said thermosetting component;

decomposing said bonded porogen; and

volatilizing said porogen whereby pores form in said composition.

33. The method of claim 32 wherein said thermosetting component (a) is functionalized.

34. The method of claim 33 wherein said thermosetting component functionality is selected from the group consisting of acetylene; 4-ethynylaniline; 3-hydroxyphenylacetylene; 4-fluorophenylacetylene; and 1-ethylcyclohexylamine.

35. The method of claim 32 wherein said porogen comprises a material having a decomposition temperature less than the glass transition temperature of said thermosetting component (a) and greater than the curing temperature of said thermosetting component (a).

36. The method of claim 35 wherein said porogen is selected from the group consisting of unsubstituted polynorbornene, substituted polynorbornene, polycaprolactone, unsubstituted polystyrene, substituted polystyrene, polyacenaphthylene homopolymer, and polyacenaphthylene copolymer.

37. The method of claim 36 wherein said porogen is functionalized.

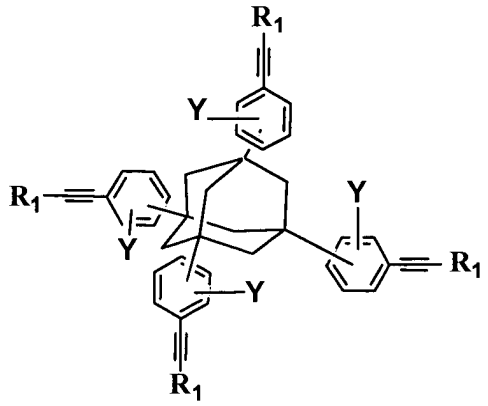
38. The method of claim 37 wherein said porogen functionality is selected from the group consisting of epoxy, hydroxy, carboxylic acid, amino, and ethynyl.

39. The method of claim 32 wherein said porogen is covalently bonded to said thermosetting component (a).

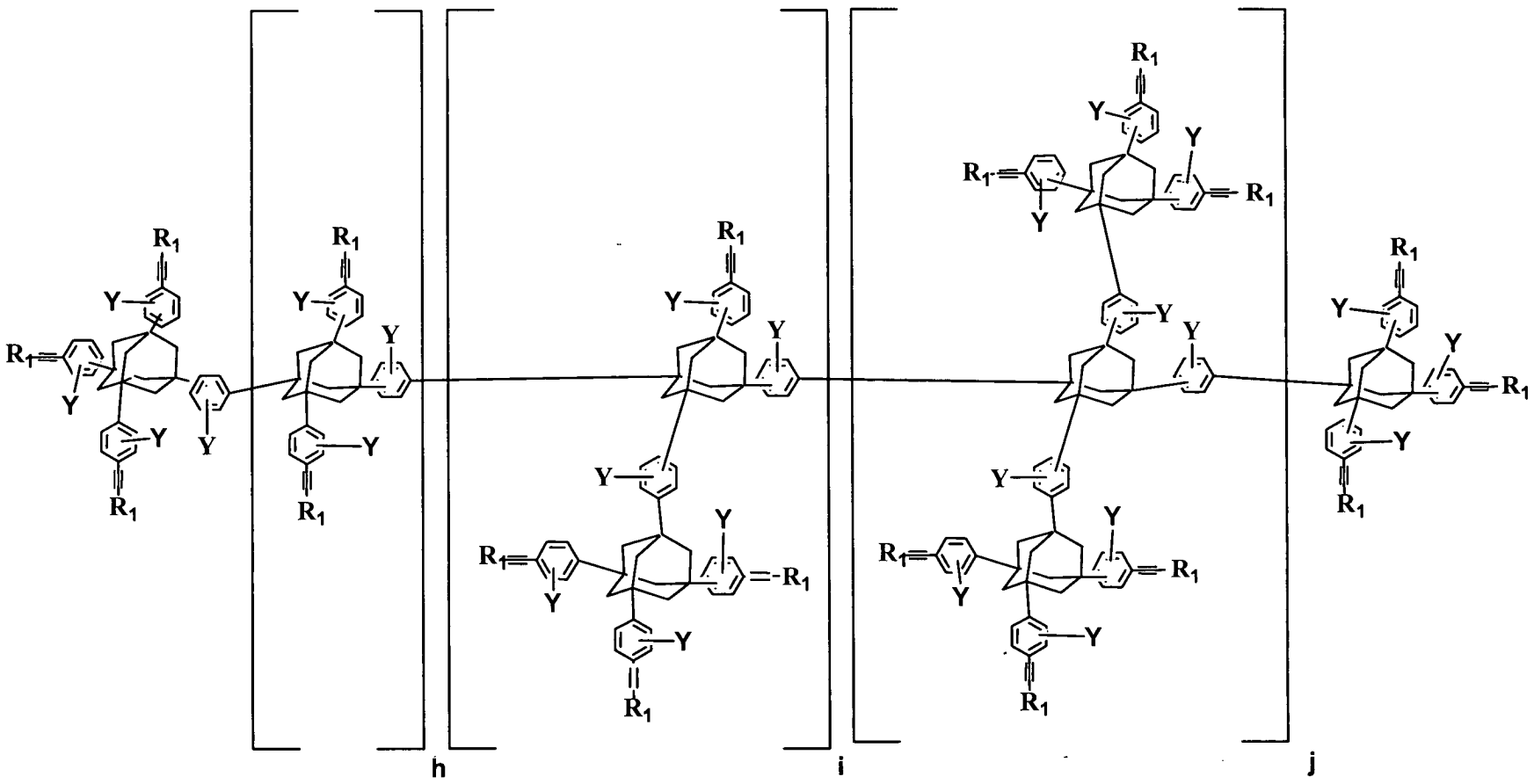
40. The method of claim 39 wherein said porogen is covalently bonded to said thermosetting component (a) through an ethynyl containing group.

41. The method of claim 40 wherein said ethynyl containing group is acetylene.

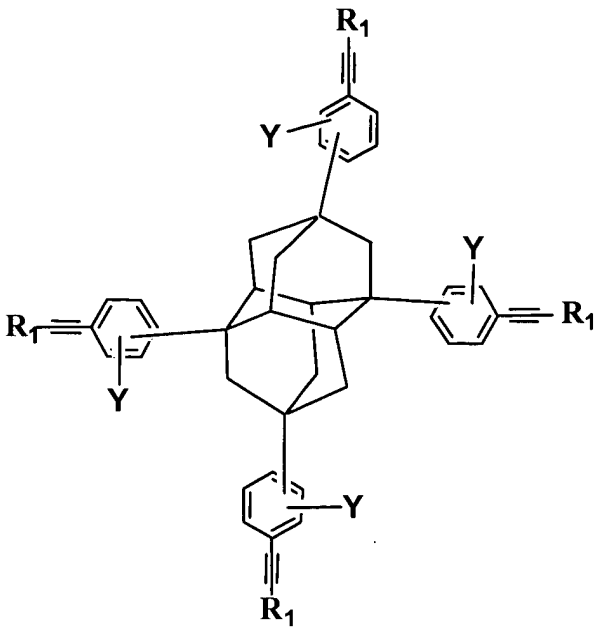
42. The method of claim 39 wherein said thermosetting component (a) comprises (1) adamantane monomer of Formula III



and (2) adamantane oligomer or polymer of Formula IV


R1
Y
h
i
j

or (1) diamantane monomer of Formula V



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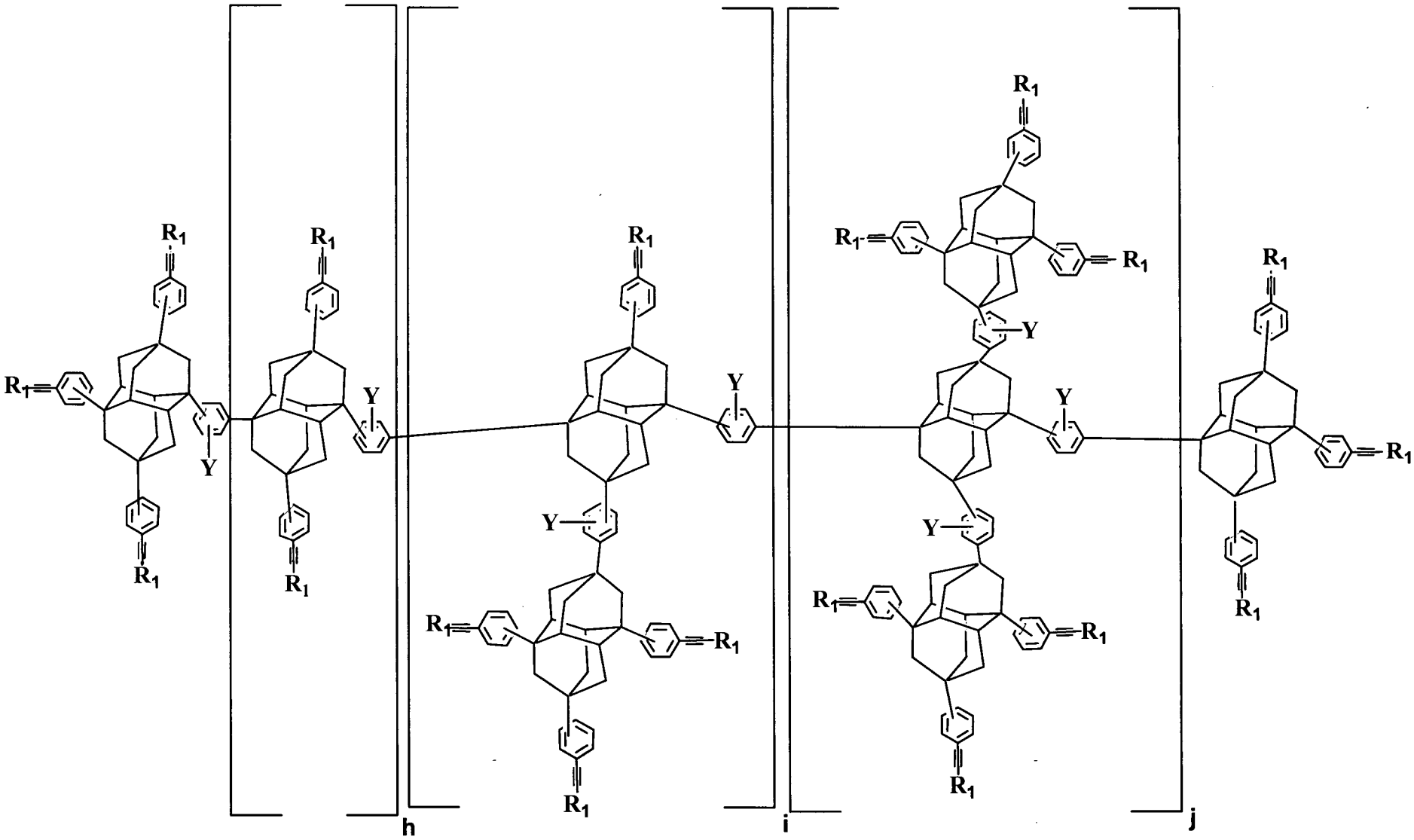
and (2) diamantane oligomer or polymer of Formula VI


R1
Y
h
i
j

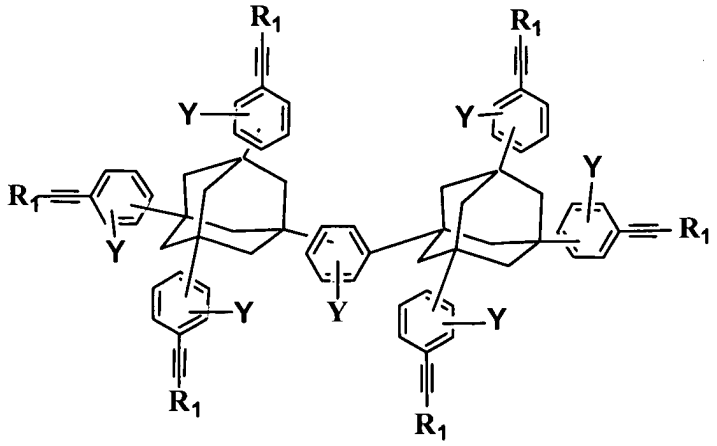
where said h is from 0 to 10; said i is from 0 to 10; said j is from 0 to 10; each of said R_1 is the same or different and selected from hydrogen, halogen, alkyl, aryl, substituted aryl, heteroaryl, aryl ether, alkenyl, alkynyl, alkoxyl, hydroxyalkyl, hydroxyaryl, hydroxyalkenyl, hydroxyalkynyl, hydroxyl, or carboxyl; and each of said Y is same or different and is selected from hydrogen, alkyl, aryl, substituted aryl, or halogen.

43. The method of claim 42 wherein said monomer is present.

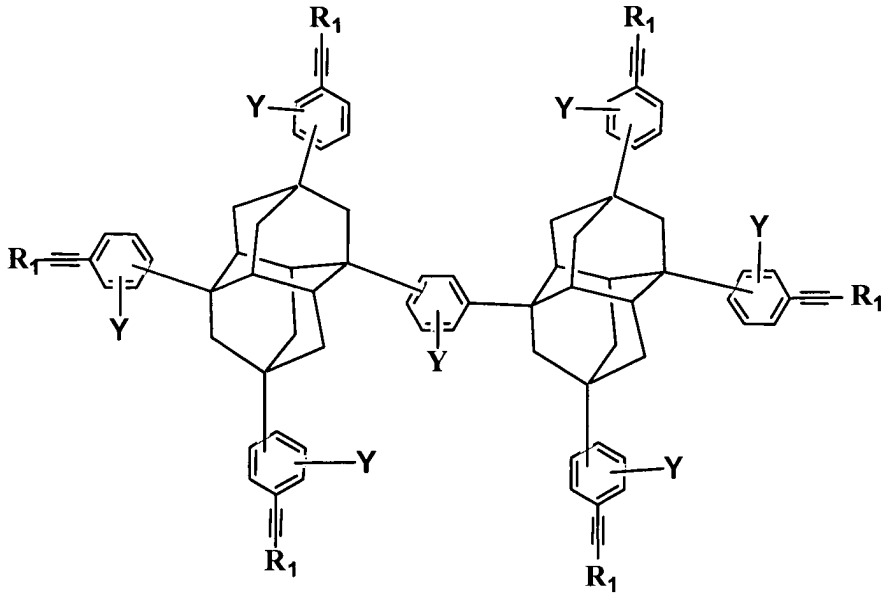
44. The method of claim 42 or 43 wherein said decomposing said porogen step comprises curing by furnace, hot plate, electron beam radiation, microwave radiation, or ultraviolet radiation.

45. The method of claim 44 wherein said R_1 is aryl or substituted aryl and said Y is hydrogen, phenyl, or biphenyl.

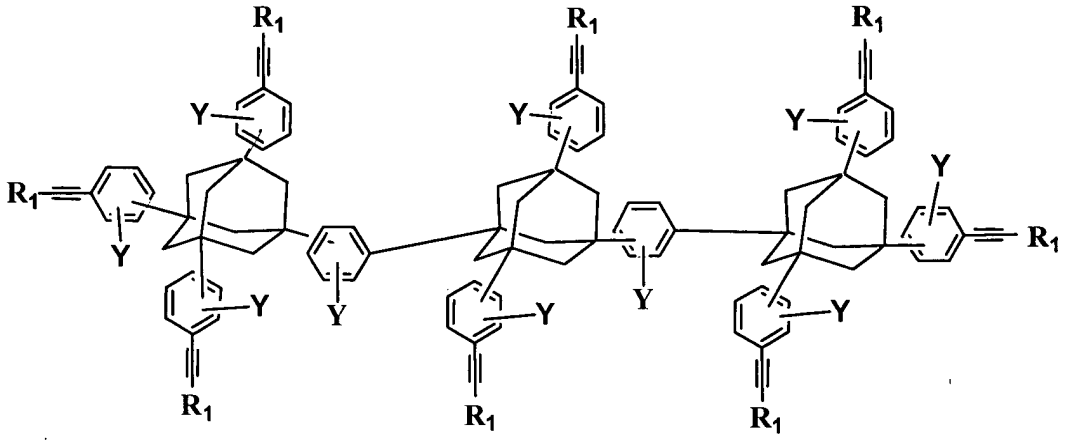
46. The method of claim 45 wherein said (2) adamantane oligomer or polymer is dimer of Formula IX



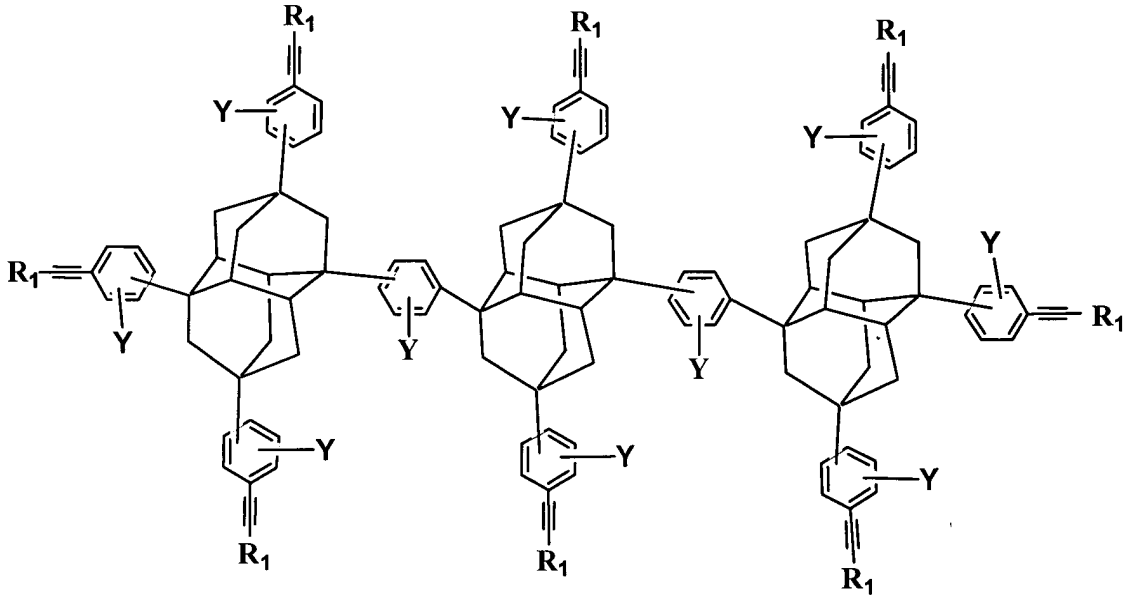
or said (2) diamantane oligomer or polymer is dimer of Formula X



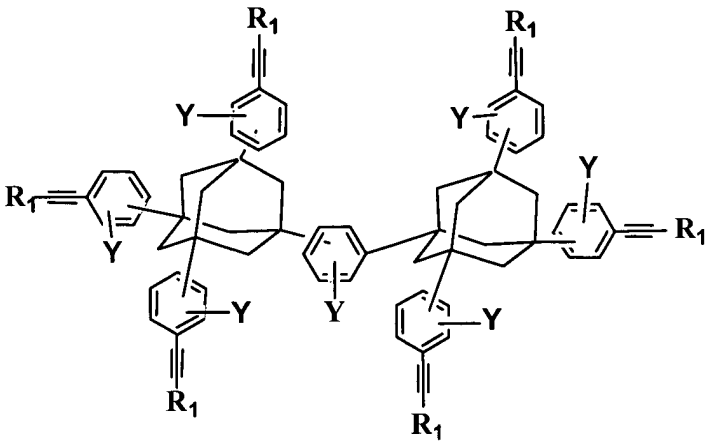
47. The method of claim 45 wherein said (2) adamantane oligomer or polymer is trimer of Formula XI



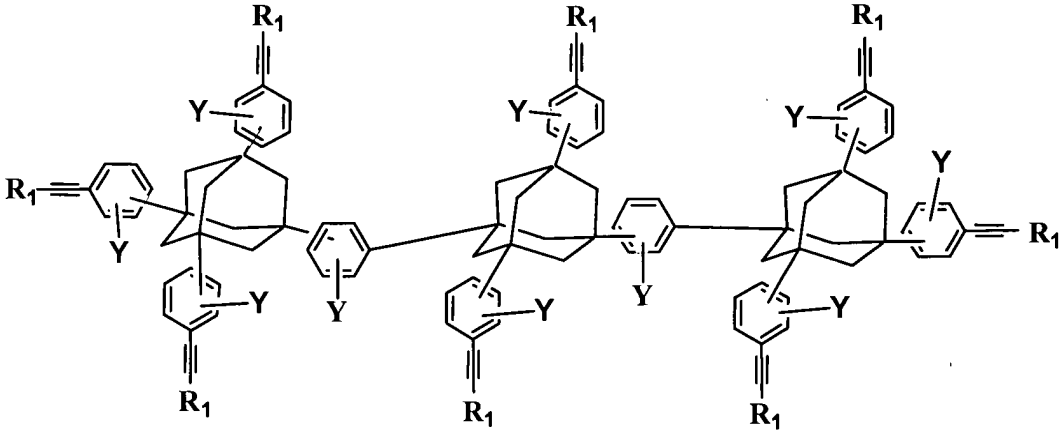
or said (2) diamantane oligomer or polymer is trimer of Formula XII



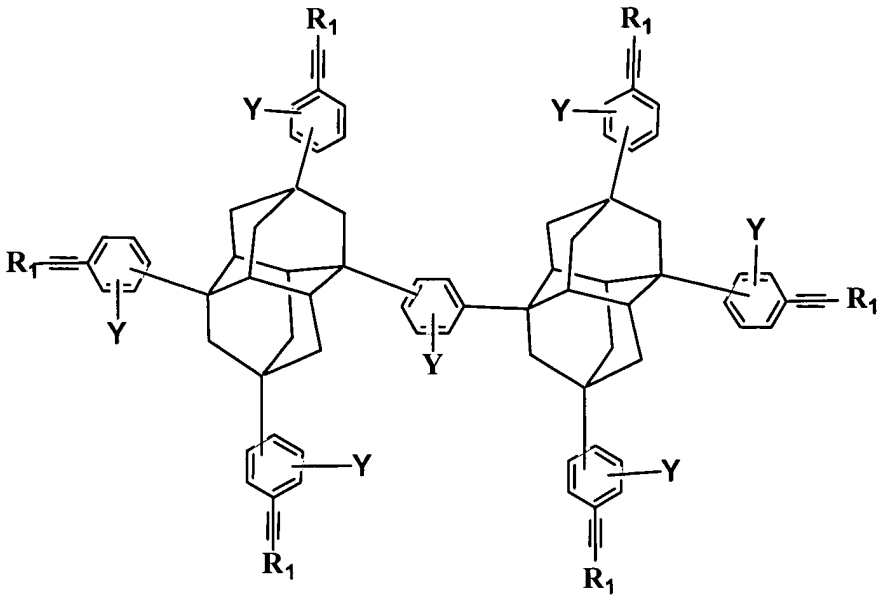
48. The method of claim 45 where in said thermosetting component (a), said oligomer or polymer (2) comprises a mixture of adamantane dimer of Formula IX



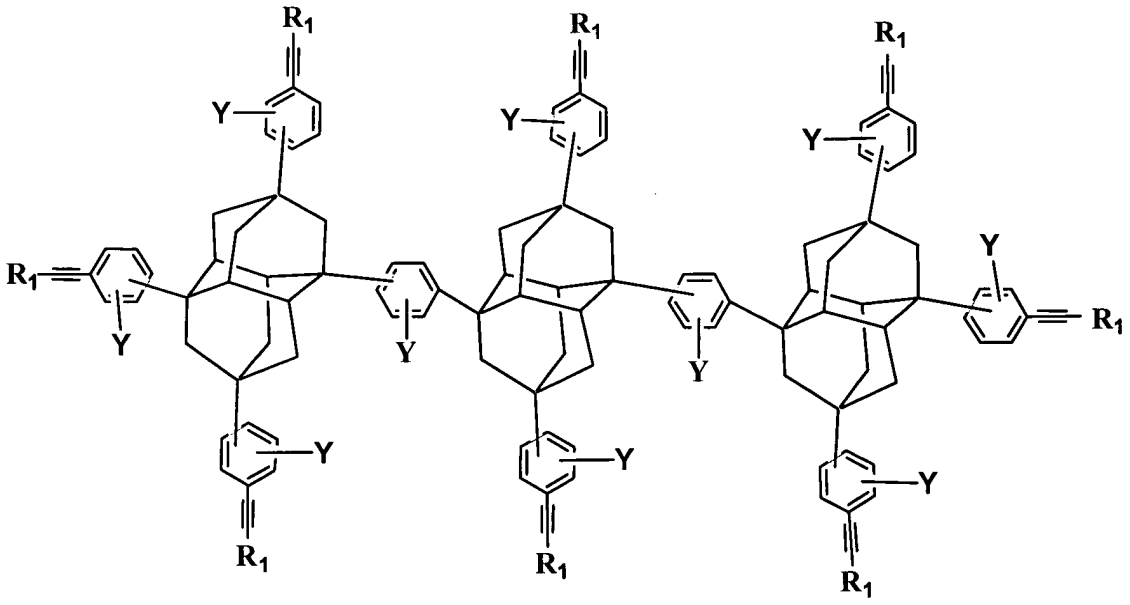
and adamantane trimer of Formula XI



or diamantane dimer of Formula X



and diamantane trimer of Formula XII



49. The method of claim 48 where in said thermosetting component (a), said monomer (1) and said oligomer or polymer (2) are adamantane based monomers.

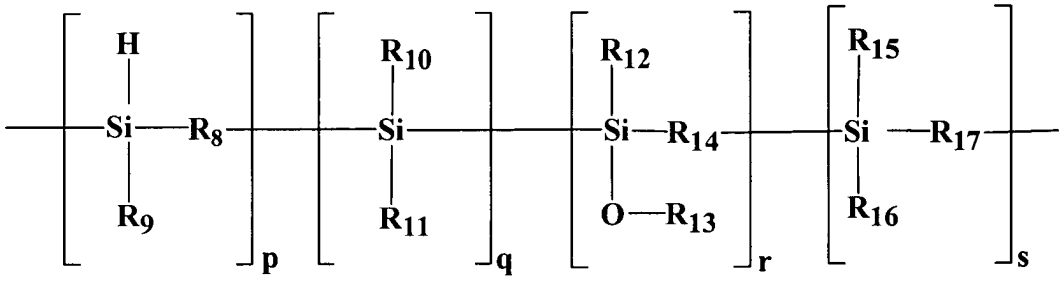
50. The method of claim 49 wherein at least two of said $R_1C\equiv C$ groups on said phenyl groups are two different isomers and at least one of said phenyl groups between two bridgehead carbons of said adamantane monomers exists as two different isomers.

51. The method of claim 50 wherein said at least two isomers are *meta-* and *para-* isomers.

52. The method of claim 44 wherein at least one of said first functionality and said second functionality of said adhesion promoter (b) is selected from the group consisting of Si containing groups; N containing groups; C bonded to O containing groups; hydroxyl groups; and C double bonded to C containing groups.

53. The method of claim 52 wherein

said Si containing group is selected from silanes of the Formula XXIV: $(R_2)_k(R_3)_lSi(R_4)_m(R_5)_n$ wherein R_2, R_3, R_4, and R_5 each independently represents hydrogen, hydroxyl, unsaturated or saturated alkyl, substituted or unsubstituted alkyl where the substituent is amino or epoxy, unsaturated or saturated alkoxyl, unsaturated or saturated carboxylic acid radical, or aryl, at least two of said R_2, R_3, R_4, and R_5 represent hydrogen, hydroxyl, saturated or unsaturated alkoxyl, unsaturated alkyl, or unsaturated carboxylic acid radical, and $k+l+m+n\leq 4$; or polycarbosilane of the Formula XXV:



in which R_8, R_{14}, and R_{17} each independently represents substituted or unsubstituted alkylene, cycloalkylene, vinylene, allylene, or arylene; R_9, R_{10}, R_{11}, R_{12}, R_{15}, and R_{16} each independently represents hydrogen atom, alkyl,

alkylene, vinyl, cycloalkyl, allyl, aryl, or arylene and may be linear or branched, R_{13} represents organosilicon, silanyl, siloxyl, or organo group, and p, q, r, and s satisfy the conditions of $[4 \leq p + q + r + s \leq 100{,}000]$, and q and r and s may collectively or independently be zero;

said C bonded to O containing groups are selected from glycidyl ethers, or esters of unsaturated carboxylic acids containing at least one carboxylic acid group;

said C double bonded to C containing groups is vinyl cyclic oligomers or polymers where the cyclic group is vinyl, aromatic, or heteroaromatic; and

said hydroxyl group is phenol-formaldehyde resins or oligomers of the Formula XXVI: – $[R_{18}C_6H_2(OH)(R_{19})]_t$- where R_{18} is substituted or unsubstituted alkylene, cycloalkylene, vinyl, allyl, or aryl, R_{19} is alkyl, alkylene, vinylene, cycloalkylene, allylene, or aryl, and t = 3-100.

54. The method of claim 53 wherein said adhesion promoter (c) is said phenol-formaldehyde resin or oligomer.